

**MAGNETIC RANDOM ACCESS MEMORY (MRAM) DEVICES HAVING
NONPARALLEL MAIN AND REFERENCE MAGNETIC RESISTORS**

Abstract of the Disclosure

MRAM devices include an MRAM substrate having a face, elongated main magnetic resistors that extend along the face and elongated reference magnetic resistors that extend along the face nonparallel to the elongated main magnetic resistors. The elongated reference magnetic resistors may extend along the face
5 orthogonal to the elongated main magnetic resistors. The elongated main magnetic resistors may be configured to have a maximum resistance or a minimum resistance, and the elongated reference magnetic transistors may be configured to have resistance midway between the maximum resistance and the minimum resistance.